

**WORLD TRADE CENTER WORKER AND VOLUNTEER  
MEDICAL SCREENING PROGRAM**

**REPORT OF INITIAL FINDINGS TO THE  
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH  
OF THE CENTERS FOR DISEASE CONTROL AND PREVENTION (NIOSH/CDC)**

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## **WORLD TRADE CENTER WORKER AND VOLUNTEER MEDICAL SCREENING PROGRAM**

### **SYMPTOMS, PHYSICAL EXAMINATION FINDINGS AND HAZARDOUS EXPOSURES EXPERIENCED BY AN INITIAL GROUP OF 250 PARTICIPANTS**

In order to assess the prevalence and severity of health problems and hazardous exposures experienced by workers and volunteers participating in the World Trade Center Worker and Volunteer Medical Screening Program, participants' medical charts were reviewed. This interim report summarizes data on a random sample of 250 of the first 500 patients examined under the auspices of the Program during the period July 16-August 29, 2002. This report presents preliminary descriptive statistics focusing on a limited number of symptoms and examination findings on this subset of examinees. No attempt has been made to establish case definitions or to use clinical diagnoses for this analysis. Additionally, we have not conducted statistical analyses controlling for factors such as smoking status, gender, or age, which will be done in future analyses. Therefore, these findings should be viewed as preliminary. As of January 23, 2003, a total of 3,513 individuals have been seen as a part of this Program. On-going analysis is being conducted on data collected from all participants in the Program.

### **Program Background**

In the months following the September 11, 2001 attacks on the World Trade Center (WTC), there became a growing concern about injuries and illnesses related to the disaster sustained by the many thousands of individuals who worked or volunteered at or near "Ground Zero." Workers at or near the WTC site had potentially sustained exposures to: 1) a range of environmental toxins, including cement and glass dust, asbestos, fiberglass, respirable and larger particulate matter - much of it highly alkaline - as well as lead and other heavy metals, PCBs, dibenzofurans, volatile organic compounds and other products of combustion; 2) psychological trauma; and 3) physical hazards including fire, collapsing buildings, falling debris, noise and extremes of temperature. There was mounting evidence of a high prevalence of respiratory illnesses among New York City firefighters and among ironworkers who were at Ground Zero. At the same time, it became clear that there were numerous other groups who were at or near the site during and after the WTC disaster who were also suffering from a variety of WTC-related health problems.

The Mount Sinai-Irving J. Selikoff Center for Occupational and Environmental Medicine (COEM) of the Department of Community and Preventive Medicine of the Mount Sinai School of Medicine in New York City, with the support of the Centers for Disease Control and Prevention (CDC), established a comprehensive medical screening program in July 2002 to provide free medical assessments, diagnostic referrals and occupational health education for workers and volunteers exposed to hazards of the World Trade Center site and/or Staten Island landfill in New York City in the aftermath of September 11, 2001. The program, based at the Mount Sinai-Irving J. Selikoff Center for Occupational and Environmental Medicine, will examine approximately 9,000 workers, about 2,500 of whom will receive examinations at other facilities in the greater New York/New Jersey metropolitan area, and nationally, under the auspices of the Association of Occupational and Environmental Clinics (AOEC).

The goals of the Program are:

- To identify individuals who sustained exposures at or near “Ground Zero” of the WTC site during rescue and recovery activities.
- To provide clinical assessments for exposed individuals to identify those with persistent WTC-related medical conditions.
- To coordinate referral for follow-up clinical care for affected individuals.
- To educate individuals about their exposures and the associated risks to their health, and to advise them about available benefit and entitlement programs.
- To establish “baseline” clinical status for individuals exposed at or near “Ground Zero” for purposes of comparison with future clinical assessments for diseases with chronicity or longer latency.

Participants have been recruited through a series of outreach efforts directed mainly to unions and other organizations whose members performed the rescue, recovery and clean-up work. Program staff have worked with the building trades unions, workers from telecommunications, transportation, the New York City morgue and the public sector, as well as police and non-New York City firefighters to inform members about the availability of the medical screening examinations. Program staff also worked with volunteer organizations including Red Cross, Salvation Army, Cross Cultural Solutions and various church and religious groups.

Each medical screening examination includes:

- 1) Comprehensive self-administered and nurse-administered medical questionnaires
- 2) Physical examination by a physician
- 3) Pulmonary function tests (spirometry) with bronchodilator administration
- 4) Standard blood tests and urinalysis
- 5) Chest x-rays
- 6) Psychological screening questionnaires, with on-site referral to mental health professionals
- 7) Interviewer-administered exposure assessment questionnaires

Each examinee is sent a final letter describing the results of his/her examination and also receives a packet of occupational health information related to the screening program, WTC-related health effects, and benefit programs.

### **Eligibility criteria**

During the initial period, beginning July 16, 2002, workers were eligible to participate in the program if they:

- 1) Worked and/or volunteered within (a) the site perimeter bounded by Chambers Street, Broadway, Rector Street and the Hudson River, or (b) the Staten Island Landfill, or (c) barge loading piers, and;
- 2) Were present on-site for at least 24 hours between 9/11 and 9/14 inclusive, and with a minimum of a total of 10 days on-site in September, and;
- 3) Performed rescue, recovery, debris cleanup and related support services.

These criteria were revised effective August 15, 2002 to allow participation by workers present on-site for at least 24 hours between 9/11 and 9/14 inclusive, or with a minimum of a total of 80

hours on-site in September.

Federal employees, New York City Firefighters, and New York State employees are covered by other medical screening programs and therefore were not eligible for this program.

## **PRELIMINARY FINDINGS**

### **Sample demographics**

The 250 participants were predominantly male (96%) and Caucasian (69%), with a median age of 40 (range 24-63). The gender distribution of these initial 250 participants is significantly different than the entire group of eligible participants. To date, newer screening participants include a larger proportion of women (see Table 1).

The largest occupational groups represented among the 250 participants were telecommunications field technicians and police officers (60% of the total sample). However, many other occupations were represented, including construction, transportation, sanitation, park and emergency medical workers (see Table 2). Since this initial sample includes a large proportion of workers (e.g., telecommunications employees) who were working near but not directly on the rubble pile, these data may underestimate the prevalence of symptoms experienced by all program participants.

### **Exposures**

The majority of participants (76%) were working at the WTC site or the landfill either on September 11, 2001 or the following day. Twenty four percent were still working at the site/landfill at the time of the examination. The remaining 76%, whose site/landfill work ended before the examination, worked a median of 94 days (range 3-324 days), or about 3 full months, on site (Table 3). Among those present in lower Manhattan on September 11, 2001 at any time of day, half were directly in the cloud of dust created by the collapse of the WTC buildings and another 31% were exposed to significant amounts of dust (see Table 4).

### **Symptoms - mental health**

About half of the sample reported symptoms on a screening questionnaire consistent with diagnosable mental health problems and/or significant problems with psychosocial functioning such as problems with a spouse/partner, children, work, or social or home life. (See Appendix 1 for a list of questions used in mental health questionnaires.) About half of the sample (52%) was referred for further evaluation by a trained psychiatric provider based on their questionnaire responses and, in a few cases, due to a clinician's judgment. About 1 in 5 participants reported symptoms on the screening questionnaire consistent with posttraumatic stress disorder (PTSD) (22%). Nearly 2 in 5 (37%) reported symptoms of anxiety, insomnia and depression (using the General Health Questionnaire), which triggered further evaluation (see Table 5).

PTSD rates, as assessed more than 10 months after the WTC disaster by the PTSD Symptom Checklist (see Appendix 1), are comparable in prevalence to other recent studies of workers in

the vicinity of the World Trade Center after the attacks. Of 191 Federal employees working near the WTC site, 25% reported symptoms consistent with PTSD 8 weeks after September 11<sup>th</sup> (1). Six months after September 11<sup>th</sup>, PTSD symptom prevalence among 374 employees at the Borough of Manhattan Community College was 15% (2). In control groups in these studies, PTSD prevalence was much lower, 4% among Dallas Federal employees, and 8% among York College employees (in New York City but not near the WTC site). The high prevalence of PTSD among our participants more than 10 months after the WTC disaster is indicative of persistent serious mental health problems (see Table 5).

### **Symptoms – upper and lower respiratory**

A large proportion of the sample reported respiratory symptoms which first developed while working at the WTC site or landfill. Additional participants reported that symptoms which had existed before September 11, 2001, had worsened while working at the site/landfill. We considered a worker to have a WTC-related symptom if the symptom either first developed after exposure at the WTC or worsened following exposure at the WTC. At least one WTC-related pulmonary symptom was reported by 78% of the sample, and at least one WTC-related ear, nose or throat (ENT) symptom was reported by 88% of the sample. In addition, about half of the sample was still experiencing at least one pulmonary symptom (46%) or ENT symptom (52%) in the month before the screening examination. Respiratory symptoms which first developed while working at the WTC site or landfill included throat irritation (44%), dry cough (38%), blowing nose more often (35%), chest tightness (28%), head or sinus congestion (26%), and shortness of breath (25%) (see Table 6). (See Appendix 2 for a list of questions about upper and lower respiratory symptoms.)

### **Physical examination and pulmonary function test findings**

Nasal mucosal inflammation was observed in 49% of the sample and swollen nasal turbinates were observed in 36% (see Table 7). Pulmonary function tests (PFTs) demonstrated a high prevalence of respiratory abnormalities. Twenty five percent of the 250 examinees had restriction, obstruction or mixed abnormalities. This high prevalence is not likely to be due to smoking, since 58% of this sample had never smoked. The proportion of examinees with significant bronchodilator response was comparable among those with restriction only, obstruction only, and combined (mixed) abnormalities, about 1/3 of each of those groups (see Table 8).

### **Evidence of disease by questionnaire and by physical examination and pulmonary function test**

We expected to find that persons with ENT or pulmonary symptoms (WTC-related symptoms in the past month) would be more likely to show abnormal findings on physical examination. This expectation was confirmed in data shown in Appendix 3. Participants with ENT symptoms were significantly more likely to have abnormal nasal physical examination findings, and participants with pulmonary symptoms were significantly more likely to have a bronchodilator response (Table 4 in Appendix 3) and slightly (although not significantly) more abnormal pulmonary function test results (Table 5 in Appendix 3).

We did not expect all workers with WTC-related ENT or pulmonary symptoms in the previous

month to have abnormalities on physical exam. This can occur for several reasons, including: 1) Symptoms can change over the course of a month, and participants with symptoms, for example, two weeks before the screening exam, may not have symptoms the day of the exam; 2) Not all individuals with symptoms will show evidence of abnormal results on these tests. More sensitive tests (i.e. methacholine challenge) can detect pulmonary abnormalities in people who are symptomatic but whose PFTs and bronchodilator response are normal.

What is most striking is that a large proportion of this sample showed evidence (either symptoms or abnormal test results) of respiratory disease more than 10 months after September 11, 2001. Seventy-three percent of the sample had either ENT symptoms or abnormal physical examination findings or both (Table 3 in Appendix 3). Similarly, 57% of the sample had either pulmonary symptoms or an abnormal pulmonary function test or both (Table 4 in Appendix 3).

### **Diagnoses prior to participation in the screening program**

Despite the high rates of abnormalities detected in these examinations, only 38% of the sample had sought and received any medical care for WTC-related health problems before participating in the screening program and even fewer had received a diagnosis of an illness. Sinusitis and/or nasal inflammation were the conditions that had been most commonly diagnosed (see Tables 9 and 10).

### **Lost work time and workers' compensation**

While 38% of the sample had previously received or were receiving medical care for WTC-related health problems at time of exam and 21% had missed workday(s) because of WTC-related health problem(s), and despite the high prevalence of symptoms and abnormal physical examination findings, only 8% of this group had filed for workers' compensation for a WTC-related injury or illness (see Table 10).

## **CONCLUSIONS**

The major findings of this preliminary analysis were that:

- Seventy-eight percent of the sample reported at least one WTC-related pulmonary symptom (first developed or worsened after exposure at the WTC site); 46% of the sample was still experiencing at least one pulmonary symptom in the month before the screening examination.
- Eighty-eight percent of the sample reported at least one WTC-related ear, nose or throat (ENT) symptom; 52% of the sample was still experiencing at least one ENT symptom in the month before the screening examination.
- Fifty-two percent of the sample reported mental health symptoms requiring further mental health evaluation and about 1 in 5 reported symptoms consistent with post-traumatic stress disorder (PTSD).

This preliminary analysis is consistent with earlier case reports that a high proportion of workers at the WTC site have been experiencing persistent WTC-related symptoms, particularly upper and lower respiratory and mental health symptoms. The high prevalence of upper respiratory symptoms is corroborated by a high prevalence of abnormalities observed upon physical

examination. Only about one-third of the participants had received any prior medical care for these symptoms and conditions, thus emphasizing the need for this screening program. Further follow-up of these workers is clearly indicated in order to monitor the chronicity and severity of these health problems and to assure that proper treatment is received.

## **REFERENCES**

1. Trout D, Nimgade A, Mueller C, Hall R, Earnest GS. Health effects and occupational exposures among office workers near the World Trade Center disaster site. *Journal of Occupational and Environmental Medicine*. 2002;44(7):601-5.
2. NIOSH. Evaluation of Physical and Mental Health Symptoms Following the World Trade Center (WTC) Disaster: Borough of Manhattan Community College and York College. HETA # 2002-0096. Cincinnati, OH: NIOSH, 2002.

## **TABLES**

**Table 1. Demographics**

|             |                  | <b>Number</b> | <b>(%)</b> |
|-------------|------------------|---------------|------------|
| Gender      | Male             | 239           | (96)       |
|             | Female           | 11            | (4)        |
| Ethnicity   | African-American | 42            | (17)       |
|             | Caucasian        | 173           | (69)       |
|             | Hispanic         | 27            | (11)       |
|             | Asian            | 5             | (2)        |
|             | Other            | 3             | (1)        |
|             |                  | <b>Median</b> |            |
| Age at exam |                  | 250           | 40         |
|             |                  | <b>Range</b>  |            |
|             |                  |               | 24-63      |

**Table 2. Current job/Industry**

|   | <b>Number</b> | <b>(%)</b> |
|---|---------------|------------|
| Field technician/Telecommunications   | 110           | (44)       |
| Police officer, detective, sergeant/Law enforcement                               | 40            | (16)       |
| Supervisor, captain, electrician/Sanitation                                       | 9             | (4)        |
| Project manager, laborer/Construction   | 8             | (3)        |
| Heavy equipment operator, highway repair/Transportation                           | 8             | (3)        |
| Officer, cleanup worker/Parks service   | 6             | (2)        |
| Engineer, Supervisor/Environmental protection                                     | 2             | (1)        |
| Paramedic/Emergency medical service   | 3             | (1)        |
| Custodian, maintenance workers/Education  | 6             | (2)        |
| Auto mechanic   | 4             | (2)        |
| Iron worker   | 4             | (2)        |
| Engineer, cameraman, photographer/News media                                      | 4             | (2)        |
| Carpenter   | 3             | (1)        |
| Asbestos worker   | 2             | (1)        |
| Laborer   | 2             | (1)        |
| Security officer, captain, electrician/Airforce, Army Nat'l Guard, US Coast Guard | 4             | (2)        |
| Operating engineer  | 2             | (1)        |
| Other <sup>1</sup>  | 27            | (11)       |
| Not reported  | 6             | (2)        |

<sup>1</sup>Other jobs: Union supervisor; Electrician; Gas attendant; Electrical construction supervisor; Engineer and tech services; Operate machinery, heavy equipment; Range coach, US navy shooting range, gas customer service/electrician tech; Automotive electrician; Lighting – film; Video-audio engineer; FDNY dispatcher; Sheet metal worker – foreman; Empire city subway - construction equipment operator; Land surveyor; Traffic enforcement officer; Expediting consultant for architectural firm; Supervisor machinist; Director of Material Science; Director of S&H; Elevator repairman; Manager, depository trust; Heavy equip mechanic; Veterans canteen services; Office of Medical Examiner; Field worker/Con Edison; Retail; Welder.

**Table 3. Exposure**

|   |            | <b>Number</b> | <b>(%)</b>            |
|---|------------|---------------|-----------------------|
| Present in lower Manhattan (south of Canal Street) on 9/11/01 at any time of day                      |            | 143           | (57)                  |
| First day worked/volunteered on WTC site (or landfill)  | 9/11/01    | 116           | (46)                  |
|   | 9/12/01    | 76            | (30)                  |
|   | 9/13/01    | 37            | (15)                  |
|   | 9/14/01    | 9             | (4)                   |
|   | 9/15-17/01 | 12            | (5)                   |
| Still working/volunteering at time of screening examination   |            | 60            | (24)                  |
|   |            |               | <b>Median</b>         |
| Length of time at site/landfill among those not still present at time of screening examination (days) |            | 188           | 94                    |
|   |            |               | <b>Range</b><br>3-324 |

**Table 4. Worst exposure to dust while in lower Manhattan at any time of day on 9/11/01**

|   | <b>Number</b> | <b>(%)<sup>1</sup></b> |
|---|---------------|------------------------|
| Not exposed to dust and not in cloud of dust from collapse of WTC buildings                             | 5             | (4)                    |
| Exposed to some dust but not in cloud of dust from collapse of WTC buildings                            | 20            | (14)                   |
| Exposed to significant amounts of dust but not directly in cloud of dust from collapse of WTC buildings | 44            | (31)                   |
| Directly in the cloud of dust from collapse of WTC buildings  | 71            | (51)                   |

<sup>1</sup> (%) based on 140 participants with complete data.

**Table 5. Mental Health Screening**

|   | Number | (%)  |
|---|--------|------|
| Received mental health referral   | 130    | (52) |
| Possible reason(s) for referral:  |        |      |
| Somatic symptoms, anxiety and insomnia, social dysfunction, or severe depression <sup>1</sup> | 92     | (37) |
| Post Traumatic Stress Disorder (PTSD) <sup>2</sup>  | 54     | (22) |
| Panic symptoms <sup>3</sup>   | 5      | (2)  |
| General anxiety <sup>3</sup>  | 15     | (6)  |
| Major depression <sup>3</sup>   | 17     | (7)  |

<sup>1</sup> From General Health Questionnaire.

<sup>2</sup> From PTSD Symptom Checklist.

<sup>3</sup> From Patient Health Questionnaire.

**Table 6. Upper and lower respiratory symptoms**

|   | First developed at WTC site |                   | Previous history and worsened at WTC site |                   | WTC-related <sup>4</sup> & still existing in month before screening |                   |
|---|-----------------------------|-------------------|---|-------------------|---|-------------------|
|   | Number                      | (%)               | Number                                    | (%)               | Number  | (%)               |
| Any pulmonary symptom below:              | 151                         | (61) <sup>1</sup> | 43  | (17) <sup>3</sup> | 113   | (46) <sup>2</sup> |
| Dry cough <sup>1</sup>                    | 95                          | (38)              | 11  | (4)               | 53  | (21)              |
| Chest tightness <sup>1</sup>              | 69                          | (28)              | 9   | (4)               | 54  | (22)              |
| Shortness of breath                       | 62                          | (25)              | 20  | (8)               | 67  | (27)              |
| Wheezing without a cold <sup>1</sup>      | 44                          | (18)              | 20  | (8)               | 29  | (12)              |
| Awakened by shortness of breath           | 27                          | (11)              | 7   | (3)               | 23  | (9)               |
| Any ENT symptom below:                    | 154                         | (62)              | 64  | (26) <sup>1</sup> | 129   | (52) <sup>1</sup> |
| Throat irritation                         | 110                         | (44)              | 9   | (4)               | 67  | (27)              |
| Blowing nose more than usual <sup>1</sup> | 87                          | (35)              | 9   | (4)               | 49  | (20)              |
| Head or sinus congestion                  | 65                          | (26)              | 46  | (18)              | 81  | (32)              |
| Postnasal discharge                       | 49                          | (20)              | 18  | (7)               | 49  | (20)              |
| Nasal irritation                          | 52                          | (21)              | 13  | (5)               | 38  | (15)              |
| Cough with phlegm                         | 51                          | (20)              | 10  | (4)               | 28  | (11)              |
| Indigestion <sup>1</sup>                  | 29                          | (12)              | 27  | (11)              | 46  | (18)              |

<sup>1</sup>(%) based on 249 participants with complete data.

<sup>2</sup>(%) based on 248 participants with complete data.

<sup>3</sup>(%) based on 247 participants with complete data.

<sup>4</sup>Symptom first developed after exposure at the WTC site or symptom worsened following exposure at WTC site.

**Table 7. Physical examination findings**

|                            | Number | (%)   |
|----------------------------|--------|-------|
| Abnormal turbinates        | 89     | (36)  |
| Nasal mucosal inflammation | 123    | (49)  |
| Sinus abnormalities        | 14     | (6)   |
| Wheezing                   | 8      | (3)   |
| Rhonchi                    | 1      | (0.4) |

**Table 8. Pulmonary function test**

| (Pre-bronchodilator)     | Number | (%)   | Significant <sup>4</sup><br>bronchodilator<br>response |                  |
|--------------------------|--------|-------|--|------------------|
|                          |        |       | Number   | (%) <sup>5</sup> |
| Normal                   | 187    | (75)  | 25   | (13)             |
| Obstruction <sup>1</sup> | 31     | (12)  | 9  | (29)             |
| Restriction <sup>2</sup> | 29     | (12)  | 11   | (38)             |
| Mixed <sup>3</sup>       | 3      | (1)   | 1  | (33)             |
| Total                    | 250    | (100) | 46   | (18)             |

<sup>1</sup>FEV<sub>1</sub>/FVC < 0.70 and FVC ≥ 80% of predicted, indicating a slowing of air flow rates through narrowed large airways.

<sup>2</sup>FVC < 80% of predicted and FEV<sub>1</sub>/FVC ≥ 0.70, indicating an inability to fully inflate the lung with a deep breath.

<sup>3</sup>FEV<sub>1</sub>/FVC < 0.70 and FVC < 80% of predicted; i.e. combined obstruction and restriction

<sup>4</sup>Bronchodilator response: 200 cc increase in FEV<sub>1</sub> and 12% increase in FEV<sub>1</sub> or 200 cc increase in FVC and 12% increase in FVC.

<sup>5</sup>Significant bronchodilator response within each group.

**Table 9. Conditions diagnosed after 9/11/01, but prior to participation in WTC Screening Program**

|                    | <b>Number</b> | <b>(%)</b>        |
|--------------------|---------------|-------------------|
| Sinusitis          | 28            | (12) <sup>1</sup> |
| Nasal inflammation | 21            | (8) <sup>2</sup>  |
| Asthma             | 7             | (3) <sup>3</sup>  |
| Anxiety            | 4             | (2)               |
| Depression         | 5             | (2)               |
| PTSD               | 7             | (3)               |
| GERD               | 7             | (3) <sup>1</sup>  |

<sup>1</sup>(%) based on 243 participants with complete data.

<sup>2</sup>(%) based on 249 participants with complete data.

<sup>3</sup>(%) based on 248 participants with complete data.

**Table 10. Medical care, lost work time, & workers' compensation**

|  | <b>Number</b> | <b>(%)</b>       |
|--|---------------|------------------|
| Previously received or currently receiving medical care for WTC-related health problem | 94            | (38)             |
| Have been hospitalized for a health problem since 9/11/01                              | 19            | (8)              |
| Missed workday(s) because of WTC-related health problem(s)                             | 52            | (21)             |
| Filed for workers' compensation because of any injury or illness related to 9/11       | 19            | (8) <sup>1</sup> |

<sup>1</sup>(%) based on 240 participants with complete data.

## **Appendix 1- Mental Health Questionnaires**

### General Health Questionnaire (GHQ)

Typical response options on a 4-point scale are: “better than usual” or “not at all” (0), “same as usual” or “no more than usual” (0), “worse than usual” or “rather more than usual” (1), “much worse than usual” or “much more than usual” (1).

A score of 1 point is provided for a self-report of “worse” or “much worse” than usual or “rather more” or “much more” than usual.

Participants scoring >4 of the GHQ are referred for a for a more in-depth mental health evaluation.

#### HAVE YOU RECENTLY:

- A1 - been feeling perfectly well and in good health?
- A2 - been feeling in need of some medicine to pick you up?
- A3 - been feeling run down and out of sorts?
- A4 - felt that you are ill?
- A5 - been getting any pains in your
- A6 - been getting a feeling of tightness or pressure in your head?
- A7 - been having hot or cold spells?

- B1 - lost much sleep over worry?
- B2 - had difficulty in staying asleep?
- B3 - felt constantly under strain?
- B4 - been getting edgy and bad-tempered?
- B5 - been getting scared or panicky for no good reason?
- B6 - found everything getting on top of you?
- B7 - been feeling nervous and uptight all the time?

- C1 - been managing to keep yourself busy and occupied?
- C2 - been taking longer over the things you do?
- C3 - felt on the whole you were doing things well?
- C4 - been satisfied with the way you've carried out your task?
- C5 - felt that you are playing a useful part in things?
- C6 - felt capable of making decisions about things?
- C7 – been able to enjoy your normal day-to-day activities?

- D1 - been thinking of yourself as a worthless person?
- D2 - felt that life is entirely hopeless?
- D3 - felt that life isn't worth living?
- D4 - thought of the possibility that you do away with yourself?
- D5 - found at times you couldn't do anything because your nerves were too bad?
- D6 - found yourself wishing you were dead and away from it all?
- D7 - found that the idea of taking your own life kept coming into your mind?

Reference: Goldberg et al., 1979;9:139-145

## Appendix 1- Mental Health Questionnaires

### PTSD Symptom Checklist (PCL)

Response options are “not at all” (1), “a little bit” (2), “moderately” (3), “quite a bit” (4), “extremely” (5)

Participants scoring 44 or higher on the sum of all 17 items on the PCL are referred for a for a more in-depth mental health evaluation.

- 
1. Repeated, disturbing *memories, thoughts, or images* of the disaster?
  2. Repeated, disturbing *dreams* of the disaster?
  3. Suddenly *acting or feeling* as if the disaster *were happening again* (as if you were reliving it)?
  4. Feeling *very upset* when *something reminded you* of the disaster?
  5. Having *physical reactions* (e.g., heart pounding, trouble breathing, sweating) when *something reminded you* of the disaster?
  6. Avoiding *thinking about or talking about* the disaster or avoiding *having feelings* related to it?
  7. Avoiding *activities or situations* because *they reminded you* of the disaster?
  8. Trouble *remembering important parts* of the disaster?
  9. *Loss of interest* in activities that you used to enjoy?
  10. Feeling *distant or cut off* from other people?
  11. Feeling *emotionally numb* or being unable to have loving feelings for those close to you?
  12. Feeling as if your *future* will somehow be *cut short*?
  13. Trouble *falling or staying asleep*?
  14. Feeling *irritable* or having *angry outbursts*?
  15. Having *difficulty concentrating*?
  16. Being “*super-alert*” or watchful or on guard?
  17. Feeling *jumpy* or easily startled?
- 

Reference: Blanchard et al. Psychometric properties of the PTSD Checklist (PCL). Behavior Research and Therapy 1996;34(8):669-673.

## Appendix 1- Mental Health Questionnaires

### Patient Health Questionnaire

Three options for scoring:

- a. Section 1 (Panic Attacks): If patient indicated “YES” on items a-d AND “YES” to at least four of items e-o.
- b. Section 2 (Generalized Anxiety Disorder): If patient answers “More than half the days” to item “a” AND three or more of items b-g
- c. Section 3 (Major Depression): If patient answers “More than half the days” or “nearly every day” to at least five of items a-i, including at least item a or b. Count item i if anything is checked off.

|   | <b>NO</b>                | <b>YES</b>               |
|---|--------------------------|--------------------------|
| 1.  |                          |                          |
| a. In the <u>last 4 weeks</u> , have you had an anxiety attack – suddenly feeling fear or panic?..... | <input type="checkbox"/> | <input type="checkbox"/> |

---

**If you answered, “no,” please skip to page 8.**

|   |                          |                          |
|---|--------------------------|--------------------------|
| b. Has this ever happened before?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Do some of these attacks come <u>suddenly out of the blue</u> — that is, in situations where you don't expect to be nervous or uncomfortable?..... | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Do these attacks bother you a lot or are you worried about having another attack?.....   | <input type="checkbox"/> | <input type="checkbox"/> |

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**Think about your last bad anxiety attack.**

|   | <b>NO</b>                | <b>YES</b>               |
|---|--------------------------|--------------------------|
| e. Were you short of breath?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Did your heart race, pound, or skip?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Did you have chest pain or pressure?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Did you sweat?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Did you feel as if you were choking?.....  | <input type="checkbox"/> | <input type="checkbox"/> |
| j. Did you have hot flashes or chills?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| k. Did you have nausea or an upset stomach, or the feeling that you were going to have diarrhea?..... | <input type="checkbox"/> | <input type="checkbox"/> |
| l. Did you feel dizzy, unsteady, or faint?.....   | <input type="checkbox"/> | <input type="checkbox"/> |
| m. Did you have tingling or numbness in parts of your body?.....                                      | <input type="checkbox"/> | <input type="checkbox"/> |
| n. Did you tremble or shake?.....   | <input type="checkbox"/> | <input type="checkbox"/> |

**Appendix 1- Mental Health Questionnaires**

o. Were you afraid you were dying?.....

**2. Over the last 4 weeks, how often have you been bothered by any of the following problems?**

**Not at all      Several days      More than half the days**

a. Feeling nervous, anxious, on edge, or worrying a lot about different things.....

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**If you checked “Not at all”, please skip to Page 9**

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b. Feeling restless so that it is hard to sit still .....

c. Getting tired very easily.....

d. Muscle tension, aches, or soreness.....

e. Trouble falling asleep or staying asleep.....

f. Trouble concentrating on things, such as reading a book or watching TV.....

g. Becoming easily annoyed or irritable.....

**3. Over the last 2 weeks, how often have you been bothered by any of the following problems?**

**Not at all      Several days      More than half the days      Nearly every day**

a. Little interest or pleasure in doing things.....

b. Feeling down, depressed, or hopeless.....

c. Trouble falling or staying asleep, or sleeping too much.....

d. Feeling tired or having little energy.....

e. Poor appetite or overeating.....

f. Feeling bad about yourself — or that you are a failure or have let yourself or your family down.....

g. Trouble concentrating on things, such as reading the newspaper or watching television.....

h. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual.....

i. Thoughts that you would be better off dead or of hurting yourself in some way.....

Reference: Spitzer et al., JAMA. 1999;282:1737-1744.

## Appendix 2 – Questions about upper and lower respiratory symptoms

| Symptom           | Question(s)  | Source(s)   |
|-------------------|--|---|
| Dry cough         | <p>A. In the 1 year before 9/11/01 did you usually have a dry cough?<br/> <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>B. Did you usually have a dry cough while you were working or volunteering at the WTC site?<br/> <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>C. If yes, to A &amp; B, did this symptom change while you were working or volunteering at the WTC site?<br/> <input type="checkbox"/> No change<br/> <input type="checkbox"/> Worse<br/> <input type="checkbox"/> Better<br/> <input type="checkbox"/> NA</p> <p>E. Within the past one month, have you usually had a dry cough?<br/> <input type="checkbox"/> Yes <input type="checkbox"/> No</p>                         |   |
| Cough w/phlegm    | <p>A. In the 1 year before 9/11/01 did you usually have a cough with phlegm?<br/> <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>B. Did you usually have a cough with phlegm while you were working or volunteering at the WTC site?<br/> <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>C. If yes, to A &amp; B, did this symptom change while you were working or volunteering at the WTC site?<br/> <input type="checkbox"/> No change<br/> <input type="checkbox"/> Worse<br/> <input type="checkbox"/> Better<br/> <input type="checkbox"/> NA</p> <p>E. Within the past one month, have you usually had a cough with phlegm?<br/> <input type="checkbox"/> Yes <input type="checkbox"/> No</p> | NIOSH Health Hazard Evaluation  |
| Wheezing w/o cold | <p>3b. In the year before 9/11/01, did your chest occasionally sound wheezy apart from colds? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>3c. In the year before 9/11/01, did your chest sound wheezy most days or nights? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>3d. In the year before 9/11/01, did you ever had an attack of wheezing that made you feel short of breath? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>4b. While you were working or volunteering at the WTC site, did your chest</p>   | ATS; NHANES III; European Community Respiratory Health Survey; IUTALD |

**Appendix 2 – Questions about upper and lower respiratory symptoms**

|                                   |   |                                |
|-----------------------------------|---|--------------------------------|
|                                   | <p>occasionally sound wheezy apart from colds? ___ Yes ___ No</p> <p>4c. While you were working or volunteering at the WTC site, did your chest sound wheezy most days or nights? ___ Yes ___ No</p> <p>4d. While you were working or volunteering at the WTC site, did you ever had an attack of wheezing that made you feel short of breath? ___ Yes ___ No</p> <p>5. If yes to 3 and 4 above, did this symptom change while you were working or volunteering at the WTC site?<br/>         ___ No change<br/>         ___ Worse<br/>         ___ Better<br/>         ___ NA</p> <p>7. Has you chest sounded wheezy or whistling in the past 1 month?<br/>         ___ Yes ___ No</p> |                                |
| Shortness of breath               | <p>A. Did you have this symptom in the 1 year before 9/11/01?<br/>         ___ Yes ___ No</p> <p>B. Did you have this symptom while you were working or volunteering at the WTC site?<br/>         ___ Yes ___ No</p> <p>C. If yes, to A &amp; B, did this symptom change while you were working or volunteering at the WTC site?<br/>         ___ No change<br/>         ___ Worse<br/>         ___ Better<br/>         ___ NA</p> <p>E. Have you had this symptom in the past one month?<br/>         ___ Yes ___ No</p>  | NIOSH Health Hazard Evaluation |
| Head or sinus congestion          | Same as above   | NIOSH Health Hazard Evaluation |
| Blowing your nose more than usual | Same as above   | SNOT-20                        |
| Throat irritation                 | Same as above   | NIOSH Health Hazard Evaluation |
| Postnasal discharge               | Same as above   | SNOT-20                        |

**Appendix 2 – Questions about upper and lower respiratory symptoms**

|  |   |  |
|--|---|--|
| Irritation in nose   | Same as above   | NIOSH Health Hazard Evaluation   |
| Chest tightness (chest tightness upon awakening or chest tightness at any other time of day) | Same as above   | European Community Respiratory Health Survey; NIOSH Health Hazard Evaluation |
| Being awakened by shortness of breath  | Same as above   | European Community Respiratory Health Survey; IUTALD                         |
| Indigestion or heartburn   | Same as above   | NIOSH Health Hazard Evaluation   |
| Provocability  | <p>When you are/were in a smoky room, in a dusty part of your house, exercising, breathing cold air, or near traffic fumes or other irritants, do/did you ever: a) start to cough; b) start to wheeze; c) feel chest tightness; d) start to feel short of breath 1) in the one year before 9/11/01? 2) while working at Ground Zero? 3) in the past month?</p> <p>&amp;</p> <p>When you are/were near animals (such as cats, dogs or horses), do/did you ever: a) start to cough; b) start to wheeze; c) feel chest tightness; d) start to feel short of breath 1) in the one year before 9/11/01? 2) while working at Ground Zero? 3) in the past month?</p> | European Community Respiratory Health Survey                                 |

## **Appendix 3 – Evidence of Disease by Questionnaire and by Physical Examination**

**Tables 1-3: Presence of WTC-related ENT symptom(s) (throat irritation, blowing nose more than usual, head or sinus congestion, postnasal discharge, or nasal irritation) still existing in past month of screening by physical examination findings. (Percents based on the total sample.)**

**Table 1**

|                |     | <b>Abnormal turbinates</b> |                        |               |            | <b>Total</b> |
|----------------|-----|----------------------------|------------------------|---------------|------------|--------------|
|                |     | <b>Yes</b>                 |                        | <b>No</b>     |            |              |
|                |     | <b>Number</b>              | <b>(%)<sup>1</sup></b> | <b>Number</b> | <b>(%)</b> |              |
| ENT symptom(s) | Yes | 56                         | (22)                   | 73            | (29)       | 129          |
|                | No  | 33                         | (13)                   | 87            | (35)       | 120          |
| Total          |     | 89                         | (36)                   | 160           | (64)       | 249          |

chi-square=6.85, df=1, p=0.009

<sup>1</sup>(%) refers to the percentage of the total, that is, the number divided by 249.

**Table 2**

|                |     | <b>Nasal mucosal inflammation</b> |                        |               |            | <b>Total</b> |
|----------------|-----|-----------------------------------|------------------------|---------------|------------|--------------|
|                |     | <b>Yes</b>                        |                        | <b>No</b>     |            |              |
|                |     | <b>Number</b>                     | <b>(%)<sup>1</sup></b> | <b>Number</b> | <b>(%)</b> |              |
| ENT symptom(s) | Yes | 84                                | (34)                   | 45            | (18)       | 129          |
|                | No  | 39                                | (16)                   | 81            | (33)       | 120          |
| Total          |     | 123                               | (49)                   | 126           | (51)       | 249          |

chi-square=26.46, df=1, p<.001

<sup>1</sup>(%) refers to the percentage of the total, that is, the number divided by 249.

**Table 3**

|                |     | <b>Either abnormal turbinates or mucosal inflammation</b> |                        |               |            | <b>Total</b> |
|----------------|-----|---|------------------------|---------------|------------|--------------|
|                |     | <b>Yes</b>  |                        | <b>No</b>     |            |              |
|                |     | <b>Number</b>   | <b>(%)<sup>1</sup></b> | <b>Number</b> | <b>(%)</b> |              |
| ENT symptom(s) | Yes | 92  | (37)                   | 37            | (15)       | 129          |
|                | No  | 54  | (22)                   | 66            | (27)       | 120          |
| Total          |     | 146   | (59)                   | 103           | (41)       | 249          |

chi-square=17.75, df=1, p<.001

<sup>1</sup>(%) refers to the percentage of the total, that is, the number divided by 249.

### **Appendix 3 – Evidence of Disease by Questionnaire and by Physical Examination**

**Tables 4 & 5: Presence of WTC-related pulmonary symptom(s) (dry cough, chest tightness, shortness of breath, wheezing without a cold, or awakened by shortness of breath) still existing in month before screening by pulmonary function test (PFT) results. (Percents based on the total sample.)**

**Table 4**

|                      |     | <b>Bronchodilator response<sup>1</sup></b> |                        |               |            | <b>Total</b> |
|----------------------|-----|--|------------------------|---------------|------------|--------------|
|                      |     | <b>Yes</b>                                 |                        | <b>No</b>     |            |              |
|                      |     | <b>Number</b>                              | <b>(%)<sup>2</sup></b> | <b>Number</b> | <b>(%)</b> |              |
| Pulmonary symptom(s) | Yes | 29   | (12)                   | 84            | (34)       | 113          |
|                      | No  | 17   | (7)                    | 118           | (48)       | 135          |
| Total                |     | 46   | (19)                   | 202           | (82)       | 248          |

chi-square value=6.96, df 1, p=.008

<sup>1</sup>200 cc increase in FEV<sub>1</sub> and 12% increase in FEV<sub>1</sub> or 200 cc increase in FVC and 12% increase in FVC.

<sup>2</sup>(%) refers to the percentage of the total, that is, the number divided by 248.

**Table 5**

|                   |     | <b>Pulmonary Function Test</b> |                        |               |            | <b>Total</b> |
|-------------------|-----|--------------------------------|------------------------|---------------|------------|--------------|
|                   |     | <b>abnormal<sup>1</sup></b>    |                        | <b>normal</b> |            |              |
|                   |     | <b>Number</b>                  | <b>(%)<sup>2</sup></b> | <b>Number</b> | <b>(%)</b> |              |
| Pulmonary symptom | Yes | 33                             | (13)                   | 80            | (32)       | 113          |
|                   | No  | 29                             | (12)                   | 106           | (43)       | 135          |
| Total             |     | 62                             | (25)                   | 186           | (75)       | 248          |

chi-square value=1.96, df 1, p=.16

<sup>1</sup>Restriction, obstruction, or mixed (restriction and obstruction).

<sup>2</sup>(%) refers to the percentage of the total, that is, the number divided by 248.

## Appendix 4

### **Activities of the World Trade Center Worker and Volunteer Medical Screening Program as of December 8, 2002**

Since its inception on April 8, 2002, the World Trade Center Worker and Volunteer Medical Screening Program has established a comprehensive medical screening program for workers and volunteers who performed rescue and recovery work at the World Trade Center site, the Staten Island landfill and barge loading piers in the aftermath of September 11, 2001.

The following are highlights of the activities related to setting up the WTC Program and conducting the examinations:

- Established an Executive Steering Committee comprised of 25 members representing labor, business, government, and medical and educational institutions. The Executive Steering Committee is the governing body of the WTC Program and has held meetings on June 14, and September 18, 2002, with a third meeting scheduled for January 10, 2003.
- Established four working groups/subcommittees to help with implementing the various facets of the WTC Program. These are the Program Council, Medical/Technical Subcommittee; Exposure Assessment Working Group; and Outreach Working Group:
  - Program Council is a large, inclusive body comprised of union leaders, safety and health professionals, government officials, and representatives of volunteer organizations. The Program Council serves in an advisory capacity to the Executive Steering Committee and meets quarterly. The Council met on June 27 and September 2, 2002 and has meetings scheduled for January 16 and May 9, 2003.
  - Medical/technical subcommittee has representatives from each of the consortium members as well as other health professionals. This subcommittee has guided the development of the clinical protocols for the examinations.
  - Exposure assessment working group is comprised of 15 environmental and occupational health specialists who have direct experience in monitoring and/or researching the human health impacts associated with the collapse of the World Trade Center. This working group has provided technical guidance in developing exposure-based eligibility criteria for the WTC Program.
  - Outreach working group is comprised of representatives from major NYC area unions having members at the WTC site, local and national volunteer organizations and government agencies. This group was convened on July 24 and November 20, 2002 and has helped to shape and implement regional and national outreach activities.
- Established the physical space with the capacity to house the medical and administrative aspects of the local, regional and national programs.
- Employed a staff consisting of physicians, nurses, pulmonary function specialists, patient care assistants, exposure assessors, schedulers, medical records specialists, outreach coordinators, an industrial hygienist, data management specialists and administrative personnel. Every effort was made to hire employees who expressed a sincere desire to play a meaningful role in the WTC Program.
- Developed an information management strategy for patient information.
- Set up a toll free phone number for enrollment and scheduling examination appointments.

## Appendix 4

- The phone bank is staffed by a group of trained employees with multi-lingual capacities.
- Developed and completed contracts to participate in this medical screening program with: the Clinical Center of the Environmental & Occupational Health Sciences Institute at UMDNJ-Robert Wood Johnson Medical School/New Jersey; Center for the Biology of Natural Systems at Queens College, Queens; Bellevue/NYU Occupational and Environmental Medicine Clinic, NYC and the Association of Occupational and Environmental Clinics, national. Contract negotiations with the SUNY Stony Brook/Long Island Occupational and Environmental Health Clinic are complete and waiting for signature.
  - Developed a detailed WTC Program training manual and conducted a full day in-service training program for regional consortium members. The in-service training consisted of an overview of WTC Program and specific training in the standardized approach for each of the elements of the clinical evaluation including: taking the comprehensive clinical history; conducting the physical examination with particular attention to nose, throat, respiratory, musculoskeletal and neurological systems; administering pre- and post-bronchodilator pulmonary function tests; gathering information about exposures at the WTC site and subsequent occupational exposures; defining blood and urine laboratory tests, and outlining the required chest radiography technique. The training also included instruction on WTC Program administrative and reporting procedures.
  - Developed a training DVD based on the in-service training for use by national screening exam providers.
  - Developed and implemented multi-lingual outreach, intake and examination procedures to assure that language is not a barrier to receiving an examination.
  - Established a referral algorithm and are a referral network in the NYC/NJ region for examinees who require follow-up medical care.
  - Developed a mental-health referral mechanism for participants.
  - Developed and continue to develop worker and volunteer recruitment materials.
  - Developed and continue to develop worker and volunteer educational materials, including information on benefits/entitlements.
  - Spoke about the WTC Program at union meetings and have acquired and continue to acquire lists of union members potentially eligible for the examinations from several unions, and from private construction firms
  - Engaged in more than 25,000 phone calls with individuals who expressed interest in receiving medical examinations and/or were identified as WTC responders by their unions, employers or volunteer organizations
  - Maintained on-going contact with officials of over 50 unions, coordinators of national and local volunteer organizations, and managers of government operations and 3 major construction firms, representing an estimated 34,000 individuals who participated in WTC rescue, recovery, cleanup and related operations.
  - Working with volunteer organizations to contact members who volunteered at the WTC site. One volunteer organization emailed 5,000 members and another volunteer organization mailed approximately 42,000 letters encouraging their WTC volunteers to contact the WTC Program to establish eligibility and schedule examinations.
  - Assisted 6 organizations/unions with mailings to almost 2,000 employees/members informing them about the WTC Program.
  - Set up a Health & Safety phone support line to provide guidance and information on prevention of exposures to workplace hazards.

#### **Appendix 4**

- Launched nationwide Public Service Announcements (PSAs) and are preparing to launch a second round of national and NYC metropolitan area PSAs in January 2003.
- Created a website providing outreach materials and WTC Program contact information.
- Conducted 2,568 clinical examinations.
- Identified significant health problems in early stages, such as lung masses, and referred individuals for appropriate care.